

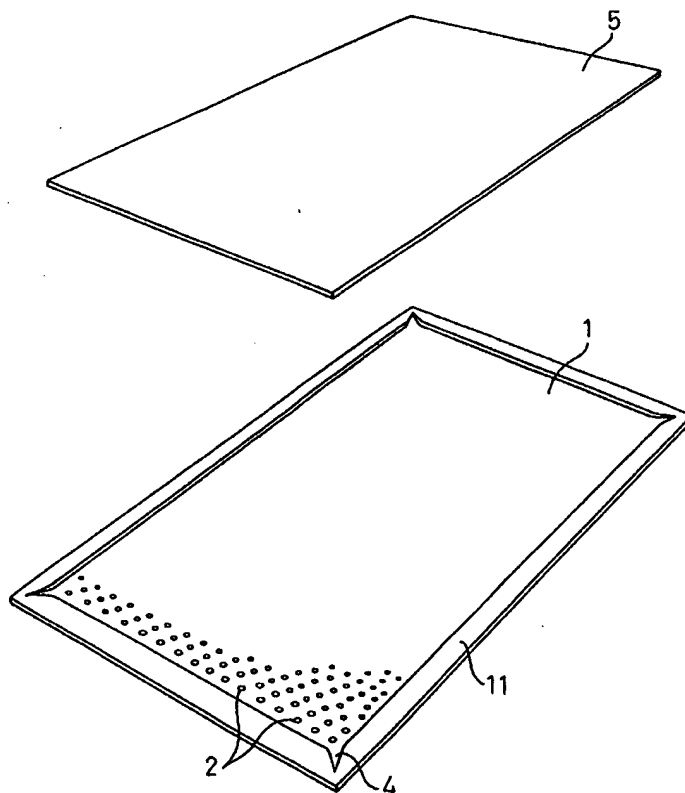


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>A47L 23/26</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/16682</b> <b>(43) International Publication Date:</b> 30 March 2000 (30.03.00)
<b>(21) International Application Number:</b> PCT/US99/19131 <b>(22) International Filing Date:</b> 24 August 1999 (24.08.99) <b>(30) Priority Data:</b> 10/268186 22 September 1998 (22.09.98) JP <b>(71) Applicant (for all designated States except US):</b> MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133-3427 (US). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> YAMAGUCHI, Shigeo [JP/JP]; 2305-4, Ohshima, Sagami-hara-city, Kanagawa pref. 229-1135 (JP). DENDA, Ikuo [JP/JP]; 9-16, Takane 2-chome, Sagami-hara-city, Kanagawa pref. 229-0021 (JP). <b>(74) Agents:</b> HAKAMAKI, Michael, A. et al.; 3M Innovative Properties Company, Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** MAT BASE AND FLOOR MAT**(57) Abstract**

An improved floor mat which is simple in structure, cheaply produced maintaining a good yield, without permitting the ends of the sheet to be undesirably turned up during the use, and requiring simple maintenance. The floor mat comprises a dust-adsorbing sheet (5), and a mat base (1) for supporting and fastening the dust-adsorbing sheet (5), wherein said dust-adsorbing sheet (5) is made of a nonwoven fabric material that can be replaced, and said mat base (1) is made of a rubber-type material, has a surface having been subjected to a sheet stabilizing treatment to prevent the movement, caused by the slipping, of the dust-adsorbing sheet, and has along its peripheral edge a sheet-fastening fitting formed integrally with the mat base.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## MAT BASE AND FLOOR MAT

### Technical Field

The present invention relates to a floor mat. More specifically, the present invention relates to a floor mat comprising a dust-adsorbing sheet, and a mat base for supporting and fastening the dust-adsorbing sheet. Owing to the property of the material that is used, the dust adsorbing sheet used in the present invention exhibits the action for adsorbing oils, solvents and other liquids in addition to the action for adsorbing dust and dirt on the floor surface or from the bottoms of shoes. Therefore, the floor mat of the present invention can be extensively used being placed around a variety of machines in the factories, in gas stations and in the backyards of restaurants to guarantee clean and safe environment. The present invention is also concerned with a mat base for use in the floor mat.

### Background of the Invention

A variety of kinds of floor mats have been proposed and improvements have been made to trap dust and dirt adhered to the bottoms of shoes of the workers and passerby and to adsorb liquids such as oils. Japanese Unexamined Utility Model Publication (Kokai) No. 4-10848 discloses a mat in which the mat body (corresponding to a dust-adsorbing sheet) is constituted by a nonwoven fabric of a resin material such as polypropylene, and a number of spot-like slip-preventing protuberances are formed on both the front and back surfaces of the mat body. Fig. 1 illustrates an example of the mat. A mat body 21 made of a nonwoven fabric of, for example, polypropylene is subjected, on the back surface thereof, to the emboss working, and is further provided, on both the front and back surfaces thereof, with a number of spot-like slip preventing protuberances 22. The slip-preventing protuberances 22 are formed by foaming a latex containing rubber. The mat body 21 is used on a base plate 23, and is fitted into a recessed portion 25 surrounded by a rising portion 24 of the base plate 23. The mat that is shown is placed in a gas station, in a factory or in a restaurant to remove oil and the like adhered to the bottoms of shoes. When the workers or passersby walk on this mat, however, the ends of the mat body are easily turned up, which may give rise to the occurrence of accident such as stumbling. Besides, the constitution of the mat

body is complex, and the step of production is complex, too, driving up the cost of production. It has therefore been desired to provide an improved mat which is simple in structure, produced at a low cost and in a high yield, and is not undesirably turned up at the edges while it is being used.

5           Furthermore, a mat that is commercially available may be the one having constitution as shown in Fig. 2. This mat has a feature in that a number of cylindrical protuberances 32 are formed on the surface of a rubber tray 33, and a thick sheet 31 made of a nonwoven fabric is placed on a portion surrounded by the peripheral edge 34 of the tray 33. With this mat, the protuberances 32 on the  
10       surface of the tray 33 prevents the sheet 31 from undesirably moving. Besides, the nonwoven fabric constituting the sheet 31 exhibits the action for removing the dust and oily dirt. The sheet 31 can be replaced after it is fouled to a noticeable degree. However, this mat is not capable of solving the above-mentioned important problem of turn-up at the edges of the sheet caused as it is trod, like the above-  
15       mentioned mat.

#### **Summary of the Invention**

          According to the present invention, there is provided a mat base for a floor mat for supporting and fastening a dust-adsorbing sheet, wherein said mat base is  
20       made of a rubber-type material, has a surface having been subjected to a sheet stabilizing treatment to prevent the movement, caused by the slipping, of the dust-adsorbing sheet, and has along its peripheral edge a sheet fastening fitting formed integrally with the mat base.

          According to the present invention, there is also provided a floor mat  
25       comprising a dust-adsorbing sheet, and a mat base for supporting and fastening the dust-adsorbing sheet, wherein said dust-adsorbing sheet is made of a nonwoven fabric material that can be replaced, and said mat base is made of a rubber-type material, has a surface having been subjected to a sheet stabilizing treatment to prevent the movement, caused by the slipping, of the dust-adsorbing sheet, and has  
30       along its peripheral edge a sheet-fastening fitting formed integrally with the mat base.

**Brief Description of the Drawings**

The present invention will be further explained with reference to the appended Figures, wherein like structure is referred to by like numerals throughout the several Figures, and wherein:

- 5           Figure 1 is a perspective view illustrating a conventional floor mat;  
            Figure 2 is a perspective view and a sectional view illustrating a portion of another conventional floor mat;  
            Figure 3 is a perspective view illustrating a preferred example of a floor mat of the present invention; and  
10           Figure 4 is a sectional view illustrating a portion of the floor mat shown in Fig. 3.

**Detailed Description of the Preferred Embodiments**

- The present invention is to solve the above-mentioned problems inherent in  
15   known floor mats.

- In order to solve the above-mentioned problems, the applicant is placing in the market a floor mat which uses a mechanical fastener (so-called "surface fastener"). In this floor mat, a mechanical fastener is mounted at least partly on the peripheral edge of a rubber mat base, so that a dust-adsorbing sheet of a nonwoven  
20   fabric can be easily fastened. Use of this floor mat makes it easy to replace the dust-adsorbing sheet, prevents turning-up at the edges of the sheet, and does not cause the structure of the mat or the production thereof from becoming so complex. When the mechanical fastener is continuously used for extended periods of time, however, fiber dust from the dust-adsorbing sheet adhere onto the hooks.  
25   In order to avoid a drop in the sheet-fixing effect, therefore, it is necessary to remove the fiber dust once in a while. That is, to provide the floor mat that requires easy maintenance is one of the problems to be solved by the present invention.

- The object of the present invention, therefore, is to provide an improved  
30   floor mat which is simple in the structure, cheaply produced maintaining a good yield, does not permit the ends of the sheet to be undesirably turned up while it is being used, and requires easy maintenance. The floor mat according to the present

invention is, usually, constituted by a combination of two elements, i.e., by a combination of a dust-adsorbing sheet, and a mat base for supporting and fastening the dust-adsorbing sheet.

There is no particular limitation on the dust-adsorbing sheet as far as it exhibits the action for adsorbing oils, solvents and other liquids in addition to adsorbing dust and dirt on the floor and on the bottoms of shoes. To obtain the effect to a sufficient degree, it is desired that the sheet is made of a nonwoven fabric material which can be replaced or, in other words, which can be discarded after the use. The nonwoven fabric that can be discarded is usually produced as a recyclable product, which is very useful from the standpoint of maintaining environment and saving resources.

The nonwoven fabric material can be produced from natural or synthetic fiber materials using conventional manners. Suitable examples of the fiber material include rayon, polyamide (nylon), polyester, polypropylene and the like, though the fiber material is in no way limited thereto only. Examples of the method of producing the nonwoven fabric material include chemical bond method, fiber locker method, stitch bond method, span bond method, melt blow method, needle punch method, and the like method, though the method is in no way limited thereto only. To put the present invention into practice, suitable fiber materials and production methods may be arbitrarily selected and combined together by taking desired effects and other factors into consideration. In particular, when it is intended to adsorb oils, it is desired that a polypropylene fiber having excellent oil-adsorbing property is used as a starting material, and is finished into a sheet of any desired shape for adsorbing dust and dirt by the spun bond method, melt blow method or needle punch method. As required, the nonwoven fabric material may be a composite material.

The dust-adsorbing sheet can be used in various shapes and sizes depending upon the place where the floor mat is used or depending upon the desired effect for adsorbing dust and dirt. Usually, the dust-adsorbing sheet is of a rectangular shape measuring, generally, 30 to 100 cm in width, 30 to 500 cm in length and 2 to 10 mm in thickness and, more preferably, measuring 45-70 cm in width, 45 to 140 cm in length and 3 to 8 mm in thickness. When it is desired to obtain the effect for

adsorbing dust and dirt over a wide area in a special application, the dust-adsorbing sheet may be used in a size larger than the above-mentioned range.

According to the present invention, the mat base is desirably made of a rubber-type material to support and fasten the dust-adsorbing sheet. Suitable  
5 examples of the rubber-type material include, though not necessarily limited thereto only, synthetic rubbers such as nitrile rubber, styrene-butadiene rubber, isoprene rubber, butadiene rubber, EPDM (ethylene-propylene-diene terpolymer) rubber, and the like. The rubber-type material used in the embodiment of the present invention has a hardness of, desirably, from 50 to 80 in terms of Shore A  
10 hardness as measured by using a durometer. When the hardness is smaller than 50, the strength so drops that the mat base no longer withstands the use for extended periods of time. When the hardness exceeds 80, on the other hand, it becomes difficult to completely prevent the dust-adsorbing sheet from slipping despite the presence of protuberances for preventing the slipping.

15 In the floor mat of the present invention, it is essential that the mat base has been subjected on its surface to the sheet stabilizing treatment to prevent the dust-adsorbing sheet from moving due to the slipping. The sheet stabilizing treatment is accomplished preferably by forming a plurality of protuberances on the surface of the mat base. Preferably, the groups of protuberances are formed of lattice-like  
20 protuberances or a collection of small cylindrical protuberances. As required, however, the protuberances may have any shape other than the cylindrical shape. The size, shape of distribution and density of protuberances can be widely changed depending upon the mat base, i.e., depending on the size of the floor mat and the purpose of its use. For instance, when reference is made to three neighboring  
25 protuberances, the cylindrical protuberances each measuring 1 mm high and 2 mm in diameter can be arranged maintaining a distance of 1 mm so as to constitute an equilateral triangle. Moreover, the protuberances can be formed simultaneously at the time of forming the mat base from the rubber-type material.

The sheet stabilizing treatment may be to coarsen the surface of the mat  
30 base in addition to forming the groups of protuberances as described above. The treatment for coarsening the surface can be effected relying on a customary method (e.g., a method which uses a rugged mold for molding the mat base, a method of

producing a mat base after having laminated a film with rugged surface on the surface of the mold). It is further allowable to employ a method of grinding the surface of the mat base to form ruggedness on the surface, a method with utilizes the corroding action using chemicals, or any other method. The degree of  
5 coarseness is sufficient when ruggedness is formed on the surface of the mat base to a degree that can be perceived and a desired slip-preventing effect is obtained.

In the floor mat of the present invention, it is essential that the peripheral edge of the mat base is provided with a sheet-fastening fitting that is integrally formed with the mat base. Desirably, the sheet-fastening fitting can be constituted  
10 as a member of the peripheral edge of the mat base. The sheet-fastening fitting can be advantageously formed by folding the peripheral edge of the mat base or joining a member (which may be made of the same rubber-type material as the mat base or of any other material when it is intended to obtain good appearance or ornamental effect) having the same shape as the folding portion to the peripheral edge of the  
15 mat base integrally therewith by sticking, adhesion with pressure or any other method. With the sheet-fastening fitting being constituted as described above, a pocket-like space is formed enabling the peripheral edge of the dust-adsorbing sheet to be inserted and held therein. The sheet-fastening fitting preferably has at least one notch formed in the peripheral edge of the mat base. To insert the  
20 peripheral edge of the dust-adsorbing sheet in the pocket-like space, the peripheral edge is turned up to facilitate the insertion. Though there is no particular limitation on the shape and number of the notches formed in the peripheral edge of the mat base, it is recommended to form nearly linear notches or V-shaped or U-shaped notches at four corners when the mat base is of a rectangular shape.

25 The floor mat of the present invention will be described in further detail with reference to the accompanying drawings.

Figure 3 is a perspective view illustrating a preferred floor mat of the present invention which is disassembled into a mat base and a dust-adsorbing sheet. The mat base 1 of the present invention is made of an acrylonitrile rubber  
30 having high resistance against oils, and measures 955 mm wide, 1541 mm long and 6 mm thick. The mat base 1 has a Shore A hardness of about 60. Cylindrical protuberances 2 are formed in groups on the whole surface of the mat base 1 to



prevent the dust-adsorbing sheet from moving due to slipping and to stably fasten the sheet. Here, the protuberances 2 are formed simultaneously with the formation of the mat base 1 each measuring 1 mm in height and 2 mm in diameter. Though the protuberances 2 are formed on the whole surface of the mat base 1 in the  
5 diagrammed embodiment, the protuberances 2 may be locally formed provided the effect of the present invention is not adversely affected.

In the peripheral edge 11 of the mat base 1 is formed a pocket-like space 3 (see Fig. 4) by folding the peripheral edge 11 so that the peripheral edge of the dust-adsorbing sheet 5 can be inserted and held therein thereby to fasten the sheet.  
10 In the diagrammed embodiment, the peripheral edge 11 of the mat base 1 is folded to form the pocket-like space 3. Instead, a separate member (which may be of the material same as, or different from the mat base 1) corresponding to the peripheral edge 11 may be joined with an adhesive to the end of the mat base 1 to integrally bond them together.

Furthermore, V-shaped notches 4 are formed in the peripheral edge 11 of the mat base 1 so that, when the peripheral edge of the dust-adsorbing sheet 5 is to be inserted in the pocket-like space 3, the peripheral edge thereof can be turned up to facilitate the operation of insertion. In the diagrammed embodiment, V-shaped notches 4 are formed at four corners of the rectangular mat base 1. The shape of  
15 the notch 4 is not limited to the V-shape as shown but may be of a linear shape or a U-shape by taking the working efficiency into consideration. Moreover, the places for forming the notches 4 are not limited to four corners of the rectangular mat base 1 but may be arbitrarily changed depending upon the desired effect.  
20

The dust-adsorbing sheet 5 comprises a nonwoven fabric obtained by  
25 treating a polypropylene fiber by the needle punch method, and measures 924 mm wide, 1520 mm long and 2.5 mm thick (corresponds to the amount of weight of 270 g/m<sup>2</sup>). The dust-adsorbing sheet 5 comprising the polypropylene nonwoven fabric can be incinerated leaving small amounts of ash and making it possible to decrease the cost of waste disposal.

30 The floor mat of this embodiment comprises the above-mentioned mat base 1 of the present invention and the dust-adsorbing sheet 5, and enables the dust-adsorbing sheet 5 to be stably fastened to the central portion (surrounded by the

peripheral edge 11) of the mat base 1. In particular, the notches 4 formed at four corners of the mat base 1 make it very easy to insert the dust-adsorbing sheet 5 in the pocket-like space 3. While the floor mat is in use, the protuberances 2 formed on the surface of the mat base 1 prevent the dust-adsorbing sheet 5 from undesirably slipping. Besides, since the peripheral edge of the dust-adsorbing sheet 5 is held in the pocket-like space 3, accidents caused by the turned-up ends of the dust-adsorbing sheet 5 is prevented in advance. Moreover, the dust-adsorbing sheet 5 that is contaminated and must be replaced, can be easily replaced by a new one.

10           The following evaluation test was conducted in order to make sure excellent slip-preventing effect exhibited by the mat base of the present invention having protuberances on the surface thereof compared with the mat base having smooth surface.

15   Sample mat base 1 (article of the present invention):

          A mat base (Shore A hardness of about 60) made of an acrylonitrile rubber similar to the mat base of the embodiment shown in Fig. 3 was prepared. During the testing, however, the peripheral edge that hinders the testing was removed in advance. The size was 60 mm wide, 60 mm long and 6 mm thick. The cylindrical  
20   protuberances measured 1 mm in height and 2 mm in diameter.

Sample mat base 2 (article for comparison):

          A sample mat base 2 was the same as the sample mat base 1 except that cylindrical protuberances were all removed from the surface to make the surface  
25   smooth.

Dust-adsorbing sheet:

          There was prepared a needle punch nonwoven fabric of polypropylene similar to the dust-adsorbing sheet of the embodiment shown in Fig. 3. The size  
30   was 150 mm wide, 3000 mm long and 2.5 mm thick (corresponds to the amount of weight of 270 g/m<sup>2</sup>).

The dust-adsorbing sheet was placed on the central portion of the sample mat base 1, a spring balance was attached to one side of the dust-adsorbing sheet, and the dust-adsorbing sheet was pulled in a horizontal direction to move it. The initial moving resistance of the dust-adsorbing sheet (resistance at the time when the dust-adsorbing sheet starts moving) was measured to be 500 g.

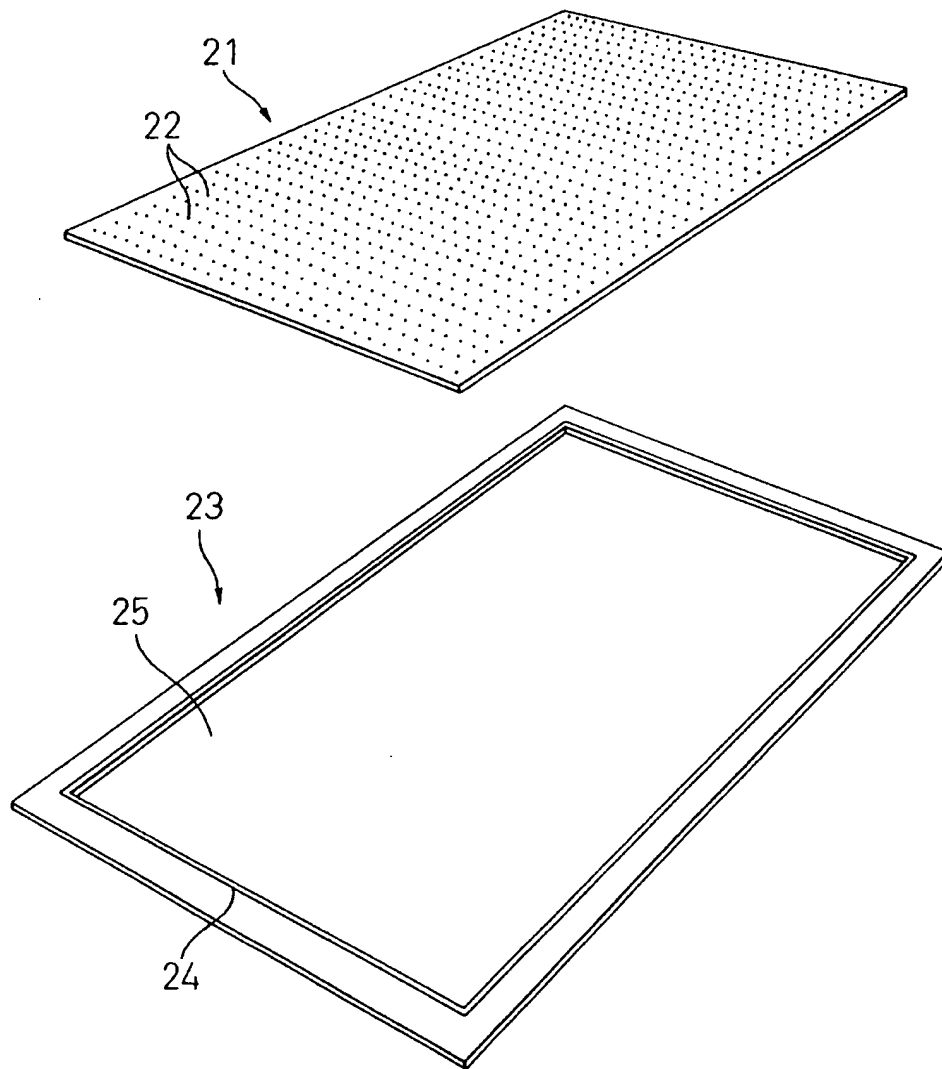
For the purpose of comparison, the sample mat base 2 was used instead of the sample mat base 1 to similarly measure the initial moving resistance. The dust-adsorbing sheet moved without any resistance, and the initial moving resistance was measured to be 0 g.

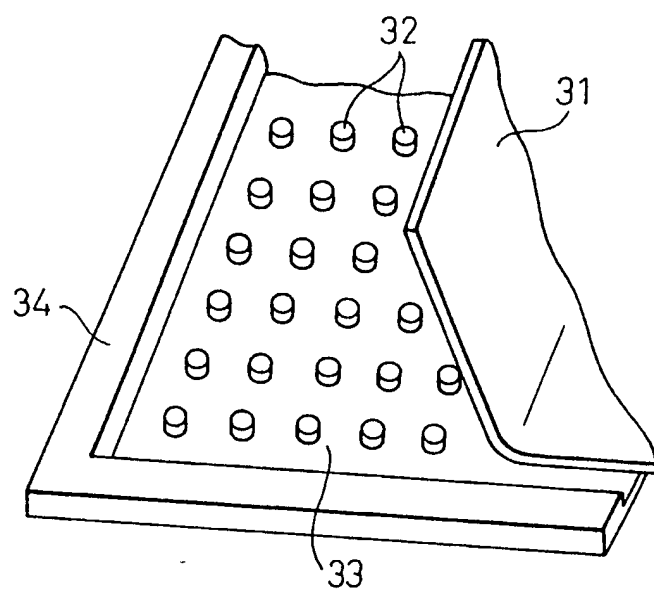
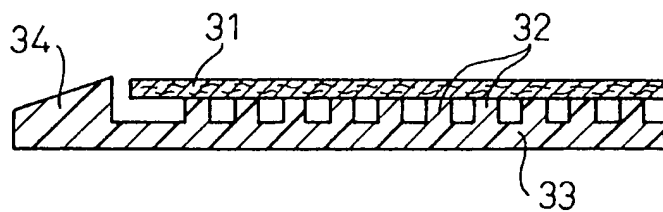
As described above, the floor mat of the present invention includes the dust-adsorbing sheet which, owing to its material, exhibits the action for adsorbing dust and dirt on the floor or on the bottoms of shoes, as well as the action for adsorbing oils, solvents, and other liquids. Therefore, the floor mat of the present invention can be extensively used being placed around the machines in the factories, in the gas stations, in the backyards of restaurants and in the like places to guarantee a clean and safe environment. While in use, furthermore, the dust-adsorbing sheet is prevented from slipping or from being turned up at the ends, and prevents the workers and passersby from running into an accident caused by stumbling.

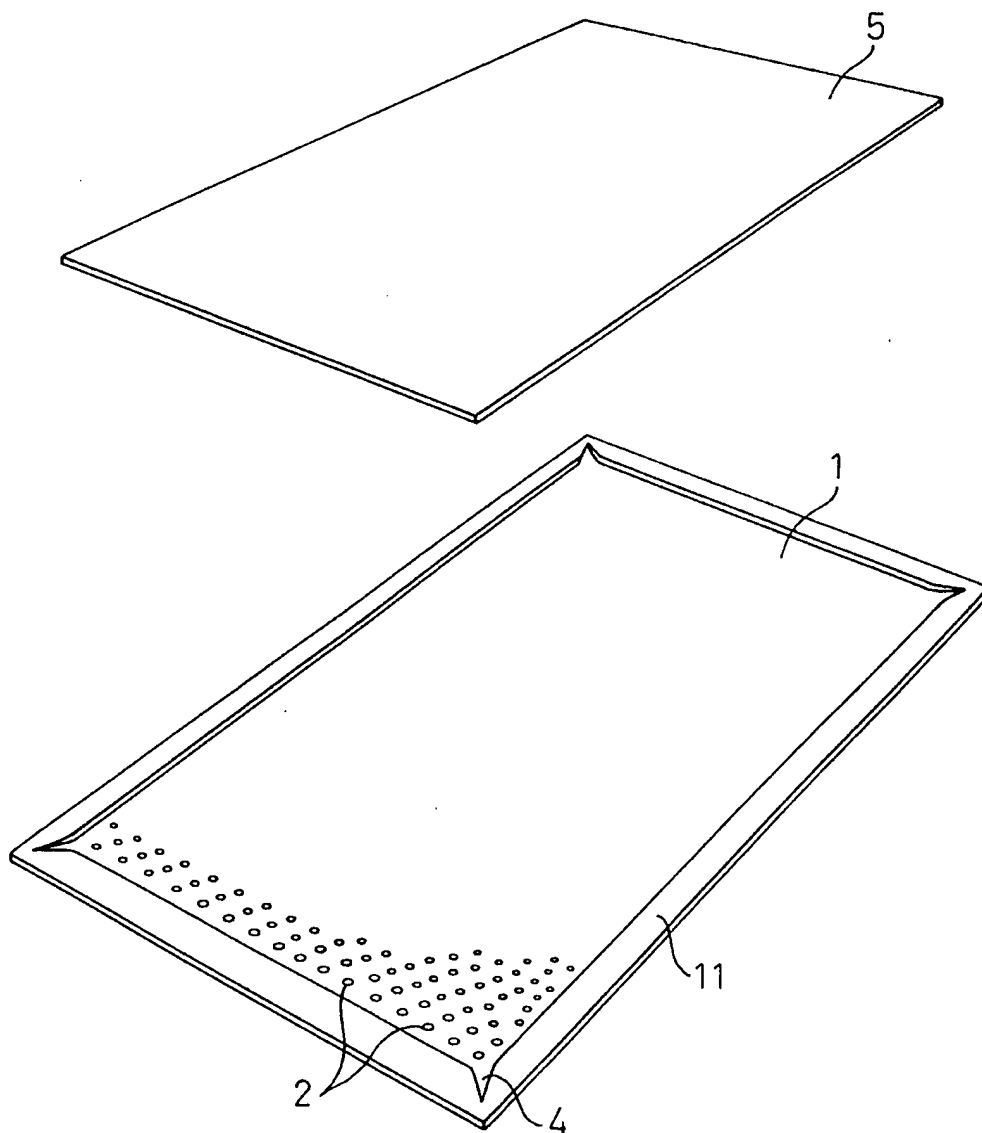
When the dust-adsorbing sheet is contaminated with oils and the like to a conspicuous degree, the notches and pocket-like space formed in the peripheral edge of the mat base of the invention enable the contaminated dust-adsorbing sheet to be replaced by a new dust-adsorbing sheet easily and reliably. Moreover, the mat base of the present invention does not catch fiber dust or dirt of the dust adsorbing sheet, and avoids a problem of drop in the sheet-fastening ability when a mechanical fastener is used and further eliminates the additional maintenance work for removing the fiber dust and dirt. Furthermore, the mat base is light in weight, tough and is flexible, and, hence, the floor mat can be used in any place.

**Claims:**

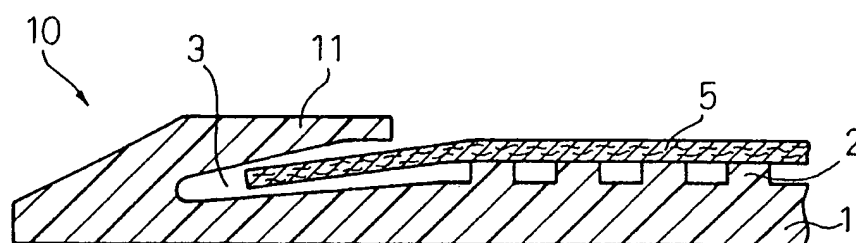
1. A mat base for supporting and fastening a dust-adsorbing sheet,  
wherein said mat base is made of a rubber-type material, has a surface having been  
5 subjected to a sheet stabilizing treatment to prevent the movement, caused by the  
slipping, of the dust-adsorbing sheet, and has along its peripheral edge a sheet-  
fastening fitting formed integrally with the mat base.
2. A mat base according to claim 1, wherein said sheet stabilizing  
10 treatment is to form a plurality of protuberances on the surface of said mat base.
3. A mat base according to claim 1, wherein said sheet stabilizing  
treatment is to coarsen the surface of said mat base.
- 15 4. A mat base according to claim 1, wherein said sheet-fastening  
fitting is a member of the peripheral edge of said mat base and has a pocket-like  
space in which the peripheral edge of said dust-adsorbing sheet is inserted and  
held.
- 20 5. A mat base according to claim 4, wherein said sheet-fastening  
fitting has at least one notch formed in the peripheral edge of said mat base,  
enabling the peripheral edge to be turned up when the peripheral edge of said dust-  
adsorbing sheet is to be inserted in said pocket-like space.
- 25 6. A floor mat comprising a dust-adsorbing sheet, and a mat base for  
supporting and fastening the dust-adsorbing sheet, wherein said dust adsorbing  
sheet is made of a non-woven fabric material that can be replaced, and said mat  
base is made of a rubber-type material, has a surface having been subjected to a  
sheet stabilizing treatment to prevent the movement, caused by the slipping, of the  
30 dust-adsorbing sheet, and has along its peripheral edge a sheet-fastening fitting  
formed integrally with the mat base.

**Fig. 1**

**Fig. 2A****Fig. 2B**



**Fig. 3**

**Fig. 4**



# INTERNATIONAL SEARCH REPORT

In Additional Application No

PCT/US 99/19131

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A47L23/26

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 578 738 A (M. R. HUGHES) 18 May 1971 (1971-05-18) column 1, lines 3-14, 27-66 column 2, lines 1-25, 41-52 claims 1-4; figures 1,5	1-3
A	—	4,6
X	US 3 435 481 A (M. KESSLER) 1 April 1969 (1969-04-01) column 1, line 60 -column 2, line 63 claims; figure	1-4,6
Y	DE 26 39 289 A (I. DROBA) 2 March 1978 (1978-03-02) page 2, paragraph 4; figure 1	1-6
	—	

-/-

**X** Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

**"E" earlier document but published on or after the international filing date**

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

**16 December 1999**

Date of mailing of the International search report

11/01/2000

Name and mailing address of the ISA  
European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

**Bourseau, A-M**

# INTERNATIONAL SEARCH REPORT

Int ional Application No

PCT/US 99/19131

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>EP 0 359 478 A (KIMBERLY-CLARK LIMITED)  21 March 1990 (1990-03-21)  column 1, line 43 -column 2, line 5  column 2, line 16 - line 20  column 4, lines 33-48, 55-58  column 5, lines 7-18, 38-58  column 6, line 1 - line 7  claims 1,2,7,8,12,13; figures 1-3,7-11</p>	1-6
A	<p>GB 2 065 469 A (H. TARUI)  1 July 1981 (1981-07-01)</p>	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/19131

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3578738	A	18-05-1971	NONE	
US 3435481	A	01-04-1969	NONE	
DE 2639289	A	02-03-1978	NONE	
EP 359478	A	21-03-1990	AT 126031 T	15-08-1995
			AU 632761 B	14-01-1993
			AU 4131989 A	22-03-1990
			CA 1328337 A	12-04-1994
			DE 68923747 D	14-09-1995
			DE 68923747 T	21-03-1996
			DK 448689 A	14-03-1990
			ES 2076966 T	16-11-1995
			FI 894330 A	14-03-1990
			GB 2222522 A, B	14-03-1990
			MX 174214 B	28-04-1994
			NO 893642 A	14-03-1990
			PT 91713 A, B	30-03-1990
			US 5018235 A	28-05-1991
GB 2065469	A	01-07-1981	AU 516841 B	25-06-1981
			CA 1156408 A	08-11-1983
			FR 2469162 A	22-05-1981
			US 4353944 A	12-10-1982